Algorithm Design and Validation for Adaptive Nonlinear Control Enhancement (ADVANCE) Technology Development for Resilient Flight Control, Phase I
Completed Technology Project (2009 - 2009)

Project Introduction

SSCI proposes to develop and test a framework referred to as the ADVANCE (Algorithm Design and Validation for Adaptive Nonlinear Control Enhancement), within which we plan to perform a comparison study of the state-of-the-art adaptive flight control algorithms on two challenging testbeds: (i) a small tailsitter unmanned aerial vehicle that is characterized by highly uncertain nonlinear dynamics, and (ii) F/A-18 aircraft under wing damage. The results of this study should give rise to a set of recommendations and guidelines regarding the use, tuning and implementation of different advanced nonlinear adaptive control algorithms to problems in flight control in the presence of large modeling uncertainties. Based on this study, we also propose to develop the ADVANCE algorithms and techniques as the most suitable combination of those that represent the state-of-the-art in nonlinear adaptive flight control. This combination will focus on retaining the most favorable features of the existing algorithms, while minimizing their disadvantages and unfavorable interactions. Specific Phase I tasks will include: (i) Problem formulation; (ii) Testbed modeling and simulation development; (iii) Simulation testing of flight control algorithms; (iv) Performance evaluation & trade study. Phase II will include further enhancement and development of the proposed ADVANCE algorithms and comprehensive testing of methods of interest through pilot-in-the-loop simulations of F/A-18 aircraft, and flight testing of the tailsitter UAV. Massachusetts Institute of Technology (Prof. Jonathan How) and Boeing Phantom Works (James Urnes, Sr.) will provide technical support under the project.

Primary U.S. Work Locations and Key Partners
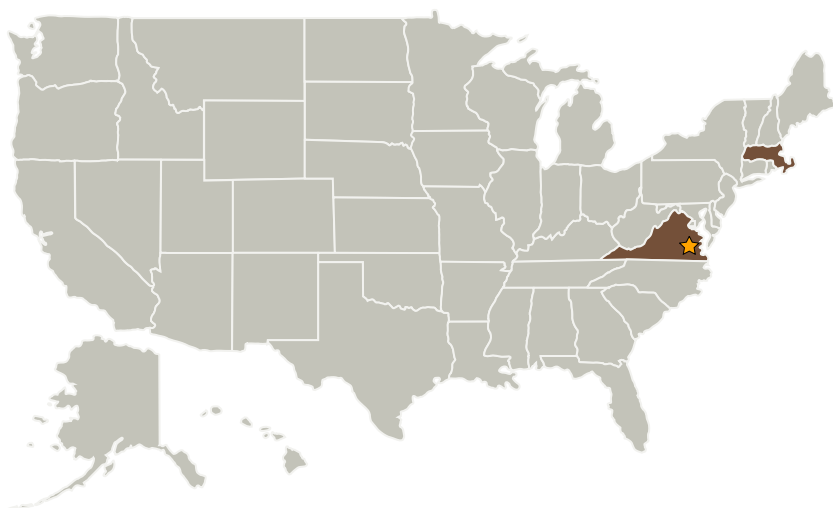
Algorithm Design and Validation for Adaptive Nonlinear Control Enhancement (ADVANCE) Technology Development for Resilient Flight Control, Phase I

Table of Contents

Algorithm Design and Validation for Adaptive Nonlinear Control Enhancement (ADVANCE) Technology Development for Resilient Flight Control, Phase I
Completed Technology Project (2009 - 2009)

Organizations Performing Work	Role	Type	Location
⭐Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Scientific Systems Company, Inc.	Supporting Organization	Industry Small Disadvantaged Business (SDB)	Woburn, Massachusetts

Primary U.S. Work Locations	
Massachusetts	Virginia

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
  └ TX17.3 Control Technologies
    └ TX17.3.1 Onboard Maneuvering / Pointing / Stabilization / Flight Control Algorithms

Tech Port

Printed on 12/08/2022
07:50 AM UTC

For more information and an accessible alternative, please visit:
https://techport.nasa.gov/view/8452

Page 2